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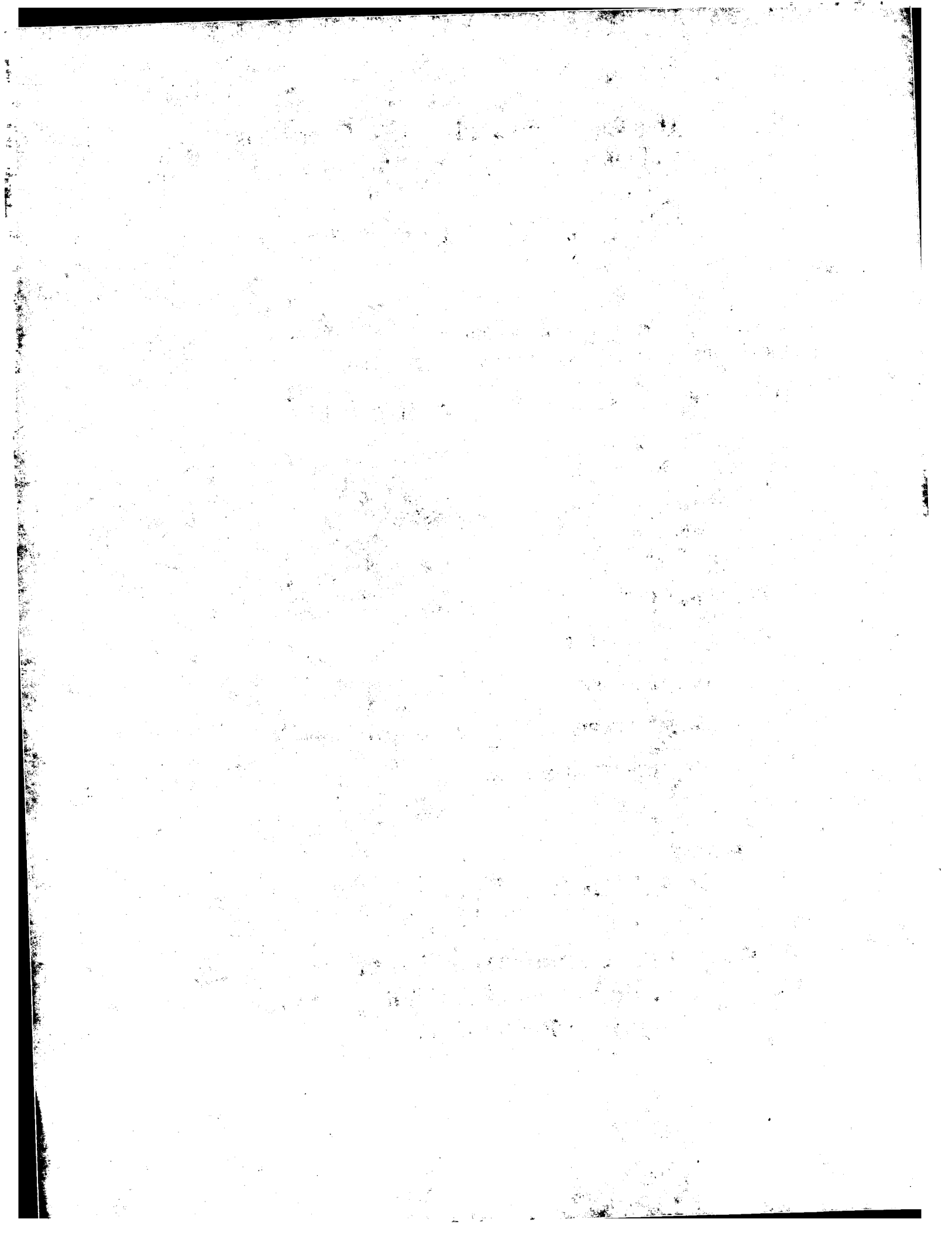
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61M 1/00, 39/22 // 16/20	A1	(11) International Publication Number: WO 96/21476
		(43) International Publication Date: 18 July 1996 (18.07.96)

(21) International Application Number: PCT/DK96/00009

(22) International Filing Date: 10 January 1996 (10.01.96)

(30) Priority Data:
0032/95 11 January 1995 (11.01.95) DK

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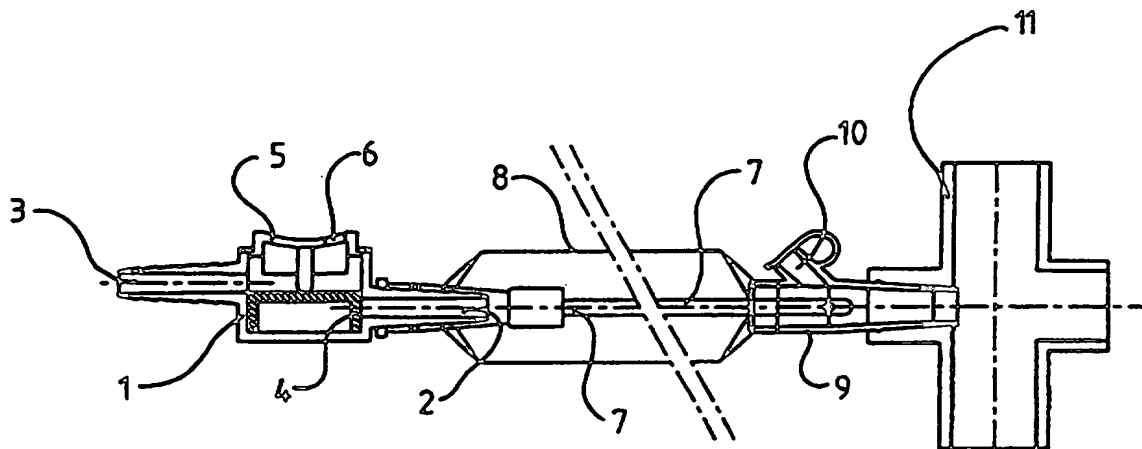
(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

With international search report.

In English translation (filed in Danish).

(54) Title: VALVE FOR CATHETER AND CATHETER SYSTEM COMPRISING SUCH A VALVE



(57) Abstract

The invention relates to a valve for adjusting the suction pressure of a suction catheter, said valve comprising a valve housing (1) having at least a first opening (2) connectable to a catheter (7), and at least a second opening (3) connectable to a vacuum source, closing means (4) arranged in the valve housing (1) for shutting off the flow path between these openings, and means (5) for suitably influencing the closing means (4) to establish flow communication between said openings (2, 3), wherein a flow path (6) is established inside the valve between the surroundings and the second opening (3) so as to prevent the establishment of an increased suction pressure at the side of the valve which faces the vacuum source.

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Valve for catheter and catheter system comprising such a valve

5 The present invention relates to a valve for adjusting the suction pressure in a suction catheter, said valve comprising a valve housing with at least a first opening connectable to a catheter, and at least a second opening connectable to a vacuum source, closing means arranged in the valve housing for shutting off the flow path between said openings, and
10 means for influencing the closing means so as to establish flow communication between said openings.

Such valve is used in particular in connection with a so-called closed catheter system wherein a catheter is connected
15 to the one opening of the valve and extends through a connecting piece for connection with the intubation tube of an intubated patient, and wherein a flexible sleeve is provided between the valve and the connecting piece which allows the catheter to slide through the connecting piece, said sleeve
20 being deformed and thus introduced into the respiratory tracts of the patient in order to discharge secretion therefrom by suction, secretion which would otherwise be impossible for the patient himself to discharge. Once the catheter is introduced into the respiratory tracts and it is
25 desired to implement the suction procedure, the valve device is influenced and the suction pressure of the suction source will thus cause the catheter to draw in the secretion through its suction opening. Following completed suction, the catheter may be withdrawn from the patient's respiratory
30 tracts, and due to the flexible sleeve enclosing the catheter between the valve and the connecting piece the catheter is prevented from being in direct contact with the surroundings. Consequently undesired bacteria growth is avoided and the same catheter may hence be used several times for performing
35 the suction procedure on the same patient which results in reduced material consumption compared to the situation when a new catheter is to be used for each suction procedure. Thus

it is possible to use the same catheter in a closed catheter system for up to 24 hours.

5 Examples of such closed catheter systems are known from US patents Nos 3,991,762, 4,569,344 and 5,134,996. A valve for adjusting the suction pressure in a suction catheter is described in further detail in US patent No. 4,872,579.

10 Known valves for adjusting the suction pressure in a suction catheter and as described e.g. in US patent No. 4,872,579 effectively shut off the flow communication between the suction source and the catheter, since both openings in the valve housing are blocked by a disconnecting body. However, this is not convenient since the second opening of the valve
15 is usually permanently connected to a suction pressure source which continuously draws in air via the second opening. Consequently a subatmospheric pressure will be established in that portion of the valve which opens towards the suction pressure source, which subatmospheric pressure exceeds the
20 pressure usually applied during the suction procedure. A suction pressure within the range of 300-400 mmHg (below atmospheric pressure which is usually about 760 mmHg) is commonly used in connection with such suction catheters. In the known valves, this pressure on the suction side of the
25 disconnecting means may be increased to about 700 mmHg. Since the catheter has been introduced into the respiratory tracts of the patient to discharge secretion by suction, this subatmospheric pressure increased upon activation of the valve will consequently occur at the suction end of the valve,
30 which pressure may cause the catheter to engage firmly with e.g. lung tissue and thus inflict damage thereto with ensuing haemorrhages.

35 It is therefore the object of the invention to provide a valve which prevents the establishment of a subatmospheric pressure which exceeds the pressure intended and convenient for the discharge of secretion by the suction procedure

proper so as to reduce the risk of inflicting damage to e.g. lung tissue.

5 According to the invention this is obtained by the establishment of a flow path between the surroundings and the second opening inside the valve.

10 Such measure means that the suction pressure source will always draw in air from the surroundings in a non-activated state of the valve when the opening facing the catheter is closed, and establishment of a subatmospheric pressure which exceeds the intended one will thus not occur whereby the risk of tissue damage is reduced.

15 According to a convenient embodiment of the valve according to the invention, this flow path between the surroundings and the second opening is provided in such a manner that the communication may shut off in a stepless manner which allows for stepless adjustment of the suction pressure from the
20 intended suction pressure to a lower suction pressure which is determined by the flow resistances in the catheter system as a whole.

25 It is further convenient that the flow path is provided integrally with the means for influencing the closing means so as to allow the flow path to be shut off by means of a finger by manually activating the opening means opening. This allows for simple and effective operation of the valve.

30 According to a preferred embodiment of the invention, the means for activating the closing means are displaceable along an axis in the valve housing, and the first and the second openings are displaced relative to each other along this axis. This permits the use of a cup-like, flexible closing
35 device which, in its unloaded state, closes the first opening and which is deformed under the influence of the pressure by the actuating means, whereby flow communication is establis-

hed between the first and the second openings. Such closing body is simple and reliable.

5 In order to prevent the entrance of bacteria and the seepage of fluid or secretion, a filter material is conveniently provided in connection with the flow path between the surroundings and the second opening.

10 To prevent the entrance of bacteria and the seepage of fluid between the mutually movable portions of the means and the valve housing proper, these portions are provided with a mutual fitting which ensures a sufficiently sealing connection between said portions by influencing the means for opening the flow path between the first and the second
15 openings.

Moreover, the invention relates to a catheter system comprising a valve as described above wherein the valve is connected to a catheter which is connected to the first opening of
20 the valve, wherein this catheter further extends through a connecting piece which is optionally in connection with the intubation tube of an intubated patient through an endotracheal mouthpiece, and wherein a flexible sleeve material is arranged between the valve and the connecting piece, which
25 material may be deformed by the introduction of the catheter into the respiratory tracts of the patient. In the connecting piece, scraping means may be provided for scraping off coatings, and/or a rinsing duct for the introduction of rinsing fluid. A convenient embodiment of the invention will
30 now be described with reference to the drawings, wherein

Figure 1 shows a valve according to the invention in a non-activated state,

35 Figure 2 shows a valve according to the invention in an activated state, wherein the closing means are

deformed for opening the connection between the first and the second openings,

5 Figure 3 shows the valve according to Figure 2 wherein the the flow connection between the surroundings and the second opening is closed by means of a finger, and

10 Figure 4 shows a valve according to the invention in connection with a so-called closed valve system.

15 Figures 1-4 illustrate a valve comprising a valve housing 1, a first opening 2 for connection with a catheter, a second opening 3 for connection with a suction pressure source (not shown), a closing body 4 for shutting off the flow path between the first and the second openings, the first opening 2 of the housing 1 being covered as shown in Figure 1.

20 To activate these closing means, an activation button 5 is provided in the housing 1. In the activation button 5, a flow connection 6 is provided in the form of a conduit, which is in connection with the second opening 3 and thus in connection with the suction source, the closing body 4 covering only the first opening 2.

25 In this preferred embodiment, the closing body 4 comprises a cylindrical portion and a substantially planar portion which ends the cylindrical portion and forms an abutment for the activation button 5. In addition to being particularly simple, this cup-like design of the closing body is very efficient.

35 Figure 1 shows the valve according to the invention in a non-activated state wherein it shuts off the flow path between the openings 2 and 3. In Figure 2 the valve is shown in an activated state where the activation button 5 is depressed into the valve housing 1 whereby a central rod-shaped body on

the activation button 5 deforms the closing body 4 so as to establish a flow communication between the openings 2 and 3.

5 Activation of the valve through the depression of the
activation body 5 makes it possible to partially or completely shut off the flow path 6 between the surroundings and the second opening 3 by means of a finger. Complete covering by a finger will mean that the suction pressure of the suction
10 source occurs at its peak value at the suction end of the catheter whereas a partial covering will allow adjustment of the suction pressure to a lower value. However, it is also possible to shut off the connection 6 in steps.

15 In this connection it is essential that the flow path between the surroundings and the second opening has a flow cross section which prevents the adverse, increased subatmospheric pressure described in the introductory part of the specification.

20 Figure 4 illustrates the valve according to Figures 1-3 in a non-activated state wherein a catheter 7 is caused to communicate with the first opening 2 by means of a connecting funnel. The opposite end of the catheter, i.e. the suction
25 end, extends through a connecting piece 9 which has been inserted into an opening in an intermediate portion, a so-called endotracheal mouthpiece 11 which is in turn connected to the intubation tube (not shown) of an intubated patient. Such endotracheal mouthpiece further comprises openings for connection to a respirator or the like. Between the connecting
30 piece, which connects the catheter 7 to the valve, and the connecting piece, a flexible sleeve 8 is arranged. In the connecting piece 9 a rinsing gate 10 is also provided which is used for the introduction of rinsing fluid for rinsing off secretion sticking to the catheter.

35

Upon displacement of the catheter 7 through the connecting piece and the intermediate piece for introduction thereof

into the respiratory tracts of the patient, the flexible sleeve 8 will fold in the displacement direction of the catheter. When the suction tip of the catheter is positioned for performing suction of the respiratory tracts, the suction procedure may be initiated by influencing the valve as described in connection with Figures 1-3. Following completed suction, the catheter may be withdrawn from the patient and it will subsequently occupy the position shown in Figure 4, which is a resting position between multiple suctions. Thus, the catheter may be used several times during a period of up to 24 hours.

C l a i m s

1. A valve for adjusting the suction pressure in a suction catheter, which valve comprises a valve housing (1) having at least a first opening (2) connectable to a catheter (7), and at least a second opening (3) connectable to a vacuum source, closing means (4) arranged in the valve housing for shutting off the flow path between these openings, and means (5) for influencing the closing means (4) to establish flow communication between these openings (2,3), characterized in that inside the valve a flow path (6) between the surroundings and the second opening (3) is established.
2. A valve according to claim 1, characterized in that the flow path (6) between the surroundings and the second opening (3) is so provided that it may be shut off steplessly.
3. A valve according to claims 1 or 2, characterized in that the flow path (6) is arranged in the means (5) for influencing the closing means (4) to allow this flow path (6) to be shut off by means of a finger by manually activating the means (5) for opening.
4. A valve according to claims 1 through 3, characterized in that the means (5) for activating the closing means (4) are displaceable along an axis in the valve housing, and that the first (2) and the second openings (3) are displaced relative to each other along this axis.
5. A valve according to claims 1 through 4, characterized in that the closing means (4) are in the form of a cup-like body made of a flexible material, said body shutting off the first opening (2) in its unloaded state, and which is deformed by pressure influence via the opening means whereby flow communication between the first (2) and the second (3) openings is established.

6. A valve according to claims 1 through 5, c h a r a c -
t e r i z e d in that a filter material is arranged in
connection with the flow path (6) which prevents the entrance
of bacteria into and fluid seepage from the valve interior to
the surroundings.

7. A valve according to claims 1 through 6, c h a r a c -
t e r i z e d in that the valve housing (1) and the means
(5) for opening the flow path between the first opening (2)
and the second opening (3) are provided with a mutual fitting
which ensures a sufficiently sealing connection between these
portions by activation of the means (5) for opening the
connection between the first opening (2) and the second
opening.

8. A catheter system comprising a valve according to
claims 1 through 7, c h a r a c t e r i z e d in that a
catheter (7) is connected to the first opening of the valve,
that the catheter extends through a connecting piece (9) for
connection, optionally via an endotracheal mouthpiece (11),
to an intubation tube of an intubated patient, and that a
flexible material piece (8) is connected to the valve, which
piece extends between the valve and the connecting piece.

9. A catheter system according to claim 8, c h a r a c -
t e r i z e d in that the connecting piece is provided with
scraping means for scraping off the secretion sticking to the
catheter upon withdrawal from the patient.

10. A catheter system according to claim 8, c h a r a c -
t e r i z e d in that the connecting piece (9) is provided
with a conduit (10) for the introduction of rinsing fluid.

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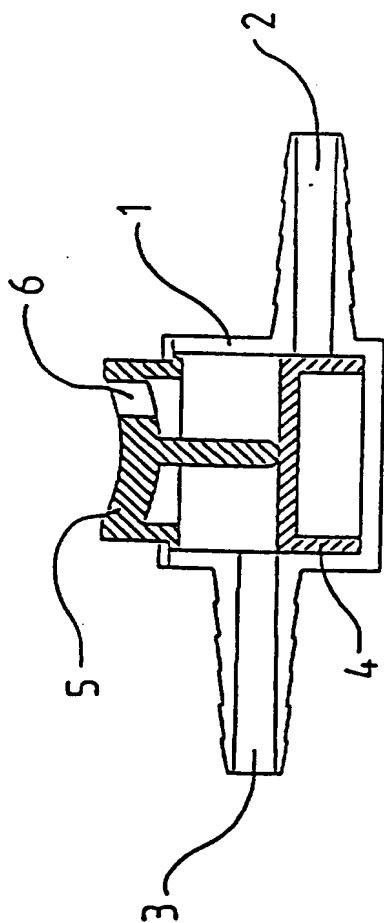


FIG. 1

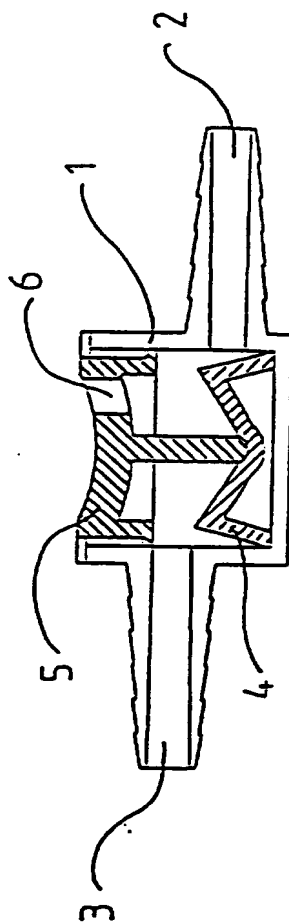


FIG. 2

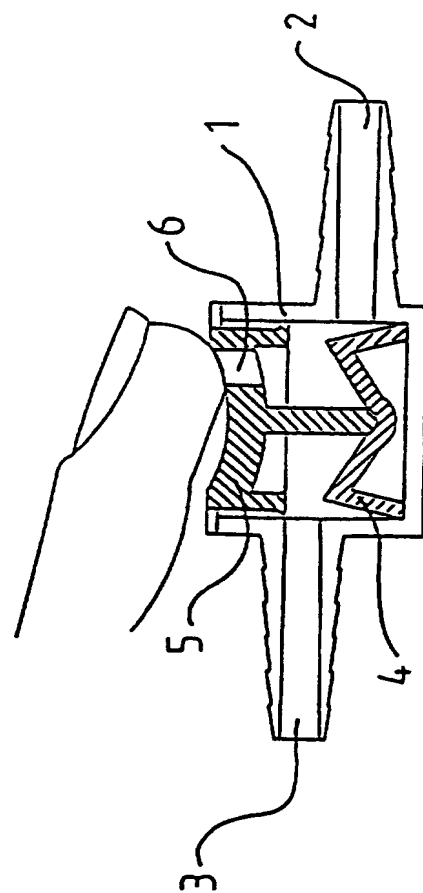


FIG. 3

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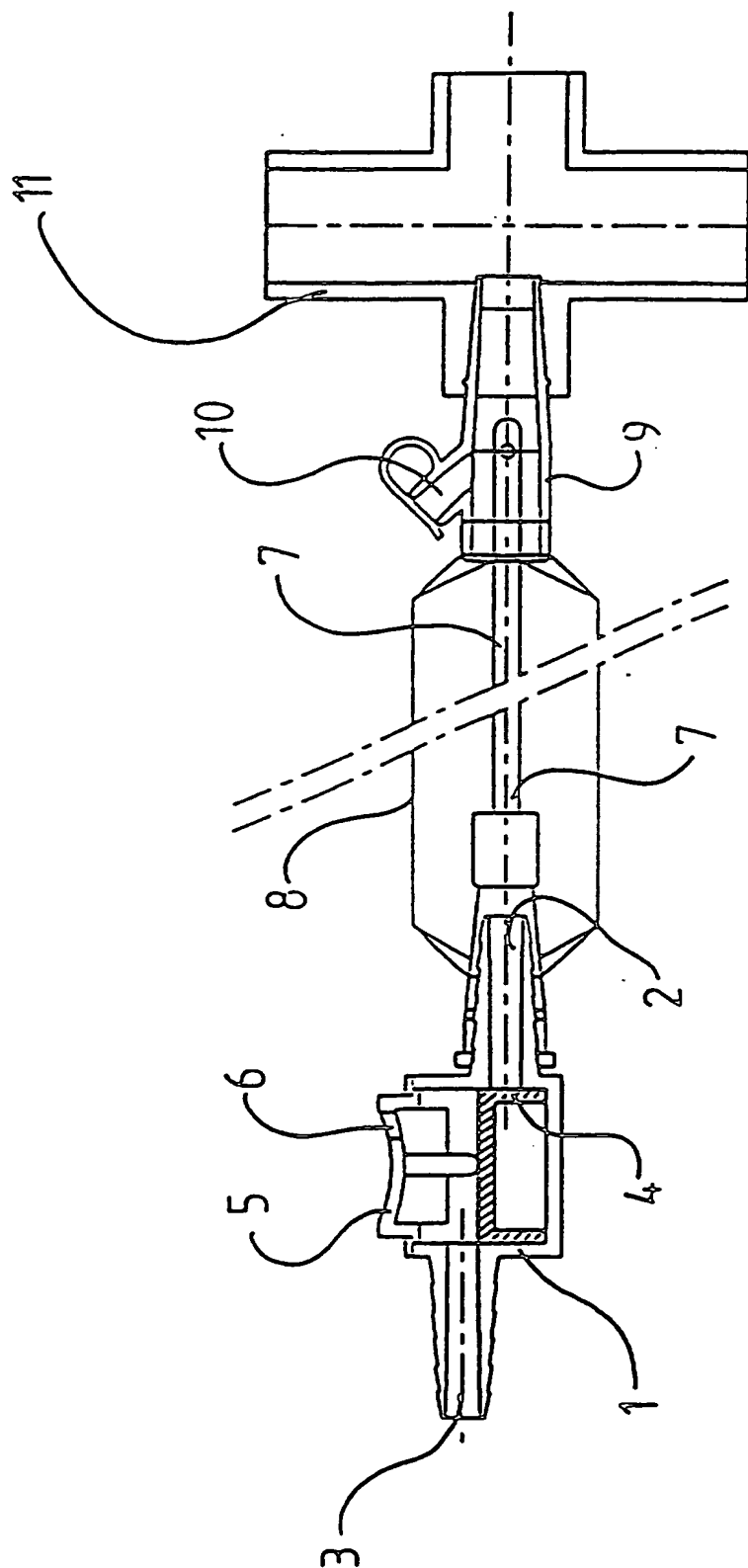


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 96/00009

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61M 1/00, A61M 39/22 // A61M 16/20
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3517669 A (F.S. BUONO ET AL), 30 June 1970 (30.06.70), figures 7-17	1-4,6,7
Y	--	5,7-10
Y	US 3991762 A (RADFORD), 16 November 1976 (16.11.76), figure 4	5,7-10
Y	US 5215522 A (PAGE ET AL), 1 June 1993 (01.06.93), figures 1,5	5,7,8,9
A	US 3335727 A (V.T. SPOTO), 15 August 1967 (15.08.67)	1

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A	US 4356823 A (JACKSON), 2 November 1982 (02.11.82) --	1
A	US 5013300 A (WILLIAMS), 7 May 1991 (07.05.91) -- -----	1

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3517669	30/06/70	DE-A- 1912287 FR-A, A- 2003719 GB-A- 1255849 SE-B- 363239	02/10/69 14/11/69 01/12/71 14/01/74
US-A- 3991762	16/11/76	NONE	
US-A- 5215522	01/06/93	US-A- 5277177 US-A- 4569344 US-A- 4638539 US-A- 4696296 US-A- 4836199 US-A- 4872579	11/01/94 11/02/86 27/01/87 29/09/87 06/06/89 10/10/89
US-A- 3335727	15/08/67	NONE	
US-A- 4356823	02/11/82	NONE	
US-A- 5013300	07/05/91	NONE	